INTRODUCTION TO SYMBOLIC LOGIC

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1.1. Simple Statements
e.g. 'The Rose is red.' 'Socrates is a man.'

1.2. Compound Statements
e.g. 'Ram goes to Kolkata and Shyam goes to Patna.'

1.3. Conjunction: 'and' 'but' etc.
Conjunts: 'Ram goes to Kolkata.' 'Shyam goes to Patna.'
Conjuctions: 'and' 'but' 'although', etc.

Symbol: ' · '
Symbolic Representation: $p \cdot q$ means '*p* and *q*'

Truth Table

p	q	$p \cdot q$
T	T	T
T	F	F
F	T	F
F	F	F

Conclusion: If a conjunction is true then all of its conjuncts are necessarily true.

1.4. Negative Statements: 'not'
e.g. 'Ram is not rich.' 'It is not true that Ram is rich.'
Explanation: It is the negation of the statement: 'Ram is rich.'
Symbol: ' ~ ' The Tilde or curl
Symbolic Representation: $\sim p$ means 'not *p*'
~ (Ram is rich)

Truth Table

p	$\sim p$
T	F
F	T

1.5 Disjunction: 'either-or'

Weak or Inclusive
e.g. 'Either Ram is a fool or is evil.'
In a weak disjunctive statement either or both of the disjuncts can be true.
At least one of the disjuncts is true, but both can be true.

Strong or Exclusive
e.g. 'Either this rose is red or it is yellow.'

In a strong disjunctive statement only one of the disjuncts can be true.
At least one of the disjuncts is true, both both cannot be true.

Symbol: ' v ' The Vel or wedge
Symbolic Representation: '*p* v *q*' means 'Either *p* or *q*'

Truth Table

p	***q***	***p* v *q***
T	T	T
T	F	T
F	T	T
F	F	F

Negation of Disjunction: 'neither-nor'
e.g. 'Neither Mohan nor Shyam will do this work.'
Representation: ~(A v B) or ~A · ~B

Use of the word 'both':
1. Ram and Shyam will *not both* do this. Rep: ~(A · B)
2. Ram and Shyam will *both not* do this. Rep: (~A) · (~B)

Use of the words 'unless, until':
'He will pass unless he falls ill' means 'Either he falls ill or he will pass.'
Rep: 'I v P' (I = ill; P = pass)

If A and B are true propositions and X and Y are false propositions, then
~[(~A v X) v ~ (B · Y)] is the truth-value
Because B is true and Y is false, 'B · Y' is false and ~ (B · Y) is true;
because A is true and X is false, t '~ A v X' is false and ~(~A v X) is true.

1.6. Conditional Statements (Hypothetical): 'If…then'
e.g. 'If you study, then you will pass.'
'You study' is the antecedent and 'you pass' is the consequent.

Rules: (1) If the antecedent is true then the consequent is also true.
(2) If the consequent is false then the antecedent is also false.
(3) If the antecedent is false then the consequent may or may not be false.
(4) If the consequent is true then the antecedent may or may not be true.

Symbol: ' ⊃ ' The horse-shoe; represents the word 'entails'
Symbolic Representation: '*p* ⊃ *q*' means '*p* entails *q*'
'*p* ⊃ *q*' = '~ (*p* · ~*q*)'

Truth Table

p	q	$\sim q$	$p \cdot \sim q$	$\sim(p \cdot \sim q)$	$p \supset q$
T	**T**	**F**	**F**	**T**	**T**
T	**F**	**T**	**T**	**F**	**F**
F	**T**	**F**	**F**	**T**	**T**
F	**F**	**T**	**F**	**T**	**T**